

6TH BIENNIAL DEVELOPMENTAL COORDINATION DISORDER UK CONFERENCE



FROM IDENTIFICATION
TO SUPPORT AND INTERVENTION

***Friday 22nd – Saturday 23rd July 2016
UNIVERSITY OF LEEDS***

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WELCOME

This year's DCD-UK conference is bringing together a wide variety of practitioners and researchers to share current good practice and explore new innovations in relation to identifying and supporting persons with Developmental Coordination Disorder (DCD). DCD is a developmental condition characterised by severe and persistent difficulties in learning everyday movements. In the UK it is estimated that between 2-5% of children satisfy the criteria for diagnosis with DCD. Children with DCD struggle with motor tasks at home (e.g. getting dressed, using cutlery), in school (e.g. handwriting, physical education) and in their leisure activities (sports, playing with others). There is also growing evidence of DCD having significant long-term impacts, as well as being associated with reduced levels of physical activity and other physical and mental health problems.

Entitled 'From Identification to Support and Intervention' our 2-day conference will focus on children with movement difficulties (primarily DCD) and the impact these difficulties have on their daily lives and the lives of those living and working with them. Each day features both posters and verbal presentations (see Keynote Speakers and Session Abstracts for more details) and will also include time to discuss issues relating to supporting children's activities of daily living.

Day 1, Friday 22nd of July

This day's primary focus will be on issues that relate directly to Identifying, Intervening and supporting individuals with diagnosed Developmental Coordination Disorder

Day 2, Sat 23rd of July

This day engages with broader issues, pertinent to DCD, such as the impact of co-occurring developmental difficulties and how to support children who experience handwriting problems

ESSENTIAL INFO

Registration

The conference registration and helpdesk is based in the main foyer of the School of Psychology. The conference registration is open from 8am both days, with the first presentations beginning at 9.30am. The final keynote speech of each day concludes at 5pm.

Note: those who wish to can check-in bags for safekeeping at the conference helpdesk.

Meals and Refreshments

A working breakfast will be available at the conference between 8am and 9.30am and tea/coffee breaks and a buffet lunch will be provided on both days (all free of charge to delegates).

Toilets

Can be found on the ground floor on the corridor running from the main foyer towards G.44 and the Staff Room or on the landing immediately outside Teaching Room 1.33/1.34 (i.e. where Keynote speeches are held)

Medical Assistance

Please contact the helpdesk immediately, who will be able to summon First Aid responders.

Fire Alarm

No fire drills are planned and in event of an alarm you should follow directions from the conference assistants, who will lead you to the fire assembly point in front of the School of Geography on University Road (see map at back of this programme).

You can contact the conference helpdesk at any time via email (dcd-uk@leeds.ac.uk) or phone (07980263546)

DAY 1 PROGRAMME

0800	Room 1.33/1.34	Room G.44
8.30		
0900		
0930		
1000	Welcome: Prof David Sugden Keynote 1: Prof Amanda Kirby <i>(Abstract Page 8)</i>	
1030		
1100		
1130	Oral Presentations Parallel Session 1 <i>(Abstracts: Page 13-17)</i>	Invited Spkr: Prof Mike Wade Parallel Session 2 <i>(Abstract Page 17)</i>
1200		
1230		
1300		
1330		
1400	Oral Presentations Parallel Session 4 <i>(Abstracts: pages 21-24)</i>	Oral Presentations Parallel Session 3 <i>(Abstracts: pages 18-20)</i>
1430		
1500	Discussion/Focus Group 1 EACD Guidelines for DCD <i>(Abstract: Page 51)</i>	
1530		
1600		
1630	Keynote 2: Dr Amanda Waterman <i>(Abstract Page 8-9)</i>	
1700		

DAY 1 PROGRAMME

0800	Room 2.18	Room 2.20	Staff Room
0830			Breakfast Served
0900			
0930			
1000			
1030			
1100		Tea/Coffee	Tea/Coffee
1130			
1200			
1230	Posters <i>(Abstracts: Pages 40-45)</i> Exhibitors <i>(See Page 11-12)</i>	Posters <i>(Abstracts: Pages 40-45)</i> Exhibitors <i>(See Page 11-12)</i>	Lunch Served
1300			
1330			
1400			
1430			
1500			
1530			
1600		Tea/Coffee	Tea/Coffee
1630			
1700			

DAY 2 PROGRAMME

0800	Room 1.33/1.34	Room G.44
8.30		
0900		
0930	Keynote 3: Dr Melissa Prunty <i>(Abstract Page 9)</i>	
1000		
1030		
1100		
1130	Oral Presentations Parallel Session 5 <i>(Abstracts: Page 25-27)</i>	Oral Presentations Parallel Session 6 <i>(Abstracts: pages 28-31)</i>
1200		
1230		
1300		
1330		
1400	Oral Presentations Parallel Session 8 <i>(Abstracts: pages 36-39)</i>	Oral Presentations Parallel Session 7 <i>(Abstracts: pages 32-35)</i>
1430		
1500	Discussion/Focus Group 2 School-Based Intervention <i>(Abstract: Page 52)</i>	
1530		
1600	Keynote 4: Prof Smits-Engelsman <i>(Abstract Page 10)</i> Closing Remarks: Prof E. Hill	
1630		
1700		

DAY 2 PROGRAMME

0800	Room 2.18	Room 2.20	Staff Room
0830			Breakfast Served
0900			
0930			
1000			
1030			
1100		Tea/Coffee	Tea/Coffee
1130			
1200			
1230	Posters <i>(Abstracts: Pages 46-50)</i> Exhibitors <i>(See Page 11-12)</i>	Posters <i>(Abstracts: Pages 46-50)</i> Exhibitors <i>(See Page 11-12)</i>	Lunch Served
1300			
1330			
1400			
1430			
1500			
1530		Tea/Coffee	Tea/Coffee
1600			
1630			
1700			

KEYNOTE SPEAKERS

Day 1, 9.40 – 10.40



Professor Amanda Kirby, University of South Wales, well known author, speaker and clinician who gave the opening address at the recent 2015 World DCD Conference in Toulouse

DCD - A lifelong disorder for some A research, clinical and parental viewpoint

This talk will take three key standpoints. Firstly, to present the current research literature relating to DCD in adulthood and implications for children's research and clinical practice in terms of what persists, changes or emerges. Secondly, a discussion relating to the clinical considerations when assessing adults with DCD. Finally, a personal and parental view will be given of living with an adult with DCD.

Day 1, 16.00 – 17.00



Dr Amanda Waterman, School of Psychology, University of Leeds working on cognitive aspects of performance and a leader in Born in Bradford Project research involving over 7,000 pupils

Motor Matters: A perspective from the 'Born in Bradford' study

Can motor and cognitive measures improve the health and education of a city? Motor impairment in the general population is recognised as a major risk factor for poor academic performance, anxiety, depression, and other physical and mental health problems. Moreover, researchers are increasingly interested in the

interplay between motor and cognition, and investigating how children's ability to complete tasks that require both motor coordination and higher-order cognitive skills is linked to educational outcomes. The Born in Bradford project is a unique prospective pregnancy and birth cohort involving over 13,000 families. Born in Bradford was established to examine how multiple factors impact on development in deprived multi-ethnic populations, with the children tracked through life. I will provide an overview of the Born in Bradford project, and discuss some of our research looking at motor and cognitive development within the primary school population.

Day 2, 09.30 – 10.30



Dr Mellissa Prunty, Brunel University London, a qualified occupational therapist working on a number of topics in DCD including handwriting and perception action studies.

Handwriting Difficulties in DCD

Children with Developmental Coordination Disorder (DCD) are often reported to have handwriting that is slow, difficult to read and sometimes painful to produce. This can lead to problems at school, as written work is required in everyday classwork and in most examinations. Surprisingly little is known about the nature of handwriting difficulties in DCD, Mellissa's PhD research aimed to provide a better description of the handwriting difficulties seen in this group, together with an understanding of the underlying mechanisms. Mellissa's session will discuss the key findings from her PhD research including implications for practice.



Professor Bouwien Smits-Engelsman, is Professor of Developmental Movement Science at the Department of Health and Rehabilitation Sciences, University of Capetown, RSA. Her main interests in DCD lie in motor control and motor learning (she has published over 100 papers on that topic). She has developed several methodologies to study and to optimize motor execution in children with poor motor skills both in fine (including handwriting) and gross motor activities.

**Handwriting problems in the 21st century:
Sense, nonsense and no-nonsense**

After discussing the purpose and use of handwriting in modern society, different forms of writing will be touched upon briefly. Next a short overview of the recent literature on handwriting will be given based on a review performed as part of the update of the EACD DCD guideline and the Dutch guideline for intervention of handwriting problems. This will be followed by an overview of studies done with a simple instrument for evaluating the quality and quantity of handwriting; the SOS (Systematic Evaluation of Handwriting Problems). The items and administration will be explained. Lastly examples of handwriting instruction based on task oriented training with self-evaluation will be given.

EXHIBITORS & PARTNERS



Pearson Assessment

"At Pearson Assessment, we are dedicated to creating proven tests that transform lives. Our specialists have developed a comprehensive range of tests proven to help psychologists identify the presence of psychological disorders and assess their severity."

Pearson will be exhibiting during the lunchtime poster sessions on both days.



Movement Matters "The UK umbrella organisation representing the major national groups concerned with children and adults with coordination difficulties, a condition called Developmental Coordination Disorder (or DCD) and sometimes referred to as

'dyspraxia'. Movement Matters was formed early in 2011 to act as an umbrella group to bring together the key bodies involved in Developmental Coordination Disorder/Dyspraxia in the UK. This includes DCD-UK, The Dyspraxia Foundation, The Developmental Adult Neuro-diversity Association (DANDA) and the National Handwriting Association."



National Handwriting Association

"A charity whose aims are to raise awareness of the importance of handwriting as a vital component of literacy, to promote good practice in the teaching of handwriting and to support those who work with children with handwriting difficulties."

The NHA will be exhibiting during the lunchtime poster sessions on both days

EXHIBITORS & PARTNERS



Dyspraxia Foundation

"A country wide charity, founded in 1987 as the Dyspraxia Trust by two mothers who met at Great Ormond Street Hospital for Sick Children. After being told that their children had Dyspraxia they were astonished and dismayed to discover that no facilities existed to help or inform parents and children with the condition. They decided to form their own group to help others to help themselves."

The Dyspraxia Foundation will be exhibiting during the lunchtime poster sessions on both days



UNIVERSITY OF LEEDS

PAC Lab

School of Psychology

This conference has been arranged in partnership with the Perception Action and Cognition Laboratory (PAC Lab) at Leeds, which has three main strands of research: successful child development, successful aging and surgical technology. With the group's keen interest in motor learning, across a wide variety of contexts, much of its research supports the advancement of our understanding of how motor skills develop across the lifespan. Check out our work at www.leeds.ac.uk/paclab



Born in Bradford is one of the biggest and most important medical research studies undertaken in the UK. The project started in 2007 and is looking to answer questions about our health by tracking the lives of 13,500 babies and their families and will provide information for studies across the UK and around the world. The aim of Born in Bradford is to find out more about the causes of childhood illness by studying children from all cultures and backgrounds as their lives unfold.

PARALLEL SESSION 1 ABSTRACTS

Assessing movement and defining deficit

Oral Presentations **Day 1, 1100-1120:** *Wilmot & Barnett*
 Day 1, 1120-1140: *Green et al.*
 Day 1, 1140-1200: *Rihtman, Wilson et al.*

Can I fit through that gap? Perceptual and action judgements of children with DCD when navigating through an aperture

K Wilmot & A L Barnett
Oxford Brookes University, Oxford, UK

Background: Passing through a narrow gap or aperture involves a perceptual judgement regarding the size of the gap and an action to pass through. Children with DCD are known to have difficulties with perceptual judgments in near space but whether this extends to far space is unknown. Furthermore, in a recent study it was found that adults with DCD do not scale movements when walking through an aperture in the same way as their peers. The current study, therefore, considered perceptual judgments and motor behaviour of children with DCD while looking at or walking through apertures.

Method: Twenty-nine children with DCD (7-17years) and 29 age and gender matched typically developing (TD) children took part. In Experiment 1, participants completed a perceptual task, where they made passability judgements about differently sized apertures. In Experiment 2, participants completed an action task where they walked through the same apertures.

Results: When making passability judgements children with DCD showed a significantly smaller critical ratio (aperture size at which a participant first rotates the shoulders to pass through) compared to their TD peers. In contrast when actually performing the task children with DCD showed a significantly larger critical ratio than TD peers. Finally, a correlation was found between perception and action judgements in the children with DCD but not the TD children.

Conclusions: Taken together these results suggest that perception within a static context is different from that within a dynamic context for children with DCD. However, despite this difference we have demonstrated a clear relationship between perception and action in children with DCD.

Comparisons of upper limb kinematics and writing performance among children with and without Developmental Coordination Disorder (DCD): Part 2 Handwriting versus Keyboarding

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¹Department of Occupational Therapy, Tel Aviv University, Tel Aviv, Israel; ²Centre for Rehabilitation, Oxford Brookes University, Oxford, UK; ³Department of Mechanical Engineering, Imperial College, London, UK

Aim: Many children with Developmental Coordination Disorder (DCD) experience difficulties in handwriting and are recommended to use a keyboard for written work. This study investigates relationships between upper-limb movement kinematics of handwriting versus keyboarding

across copying and dictation tasks of children with DCD and typically developing children (TDC).

Method: A 3-D motion capture system (Qualysis) analyzed upper limb kinematics and characterise movement patterns of children with and without DCD, matched for age, gender and parent education. Movement parameters during writing tasks, using a standardized handwriting assessment of copying and dictation (A-A Handwriting), were contrasted with equivalent tasks on a keyboard.

Results: Thirty children (DCD, n=15 and non-DCD n=15; mean age 8.05; SD 11.1 (participated in the study. No child had received typing training. Hours of computer time per week differed between groups ($t(28)=-3.04$, $p=.005$) and therefore included as covariates in comparisons. Significant differences were evident in productivity. Children with DCD typing fewer letters than TDC in both copying ($F(2,27) 11.42$, $p<.001$, $\eta^2=.458$) and dictation ($F(2,27) 14.78$, 20.27 , $p<.001$, $\eta^2=.523$). Correlations between copying and dictation across handwriting and keyboarding

varied between groups with different movement patterns associated with productivity. Reduced arm and wrist movements of children with DCD were associated with reduced productivity in keyboard copying ($r=-.747$, $p=.001$) and dictation ($r=-.556$, $p=.031$) and with poor maintenance of margins ($r=-.636$, $p=.011$). Whereas for TDC control of movements of the wrist was only related to productivity during keyboard copying ($r=.678$, $p=.008$).

Discussion: Children with DCD produced fewer legible letters in comparable handwriting and typing tasks than their TDC counterparts. Patterns of movement kinematics associated with productivity differed between groups. These results have implications for use of keyboards as a substitute for handwriting for children with DCD; particularly with respect for the need for training to ensure appropriate hand postures for typing.

Can a little instrument make a big noise? A cross-cultural collaboration for identifying motor delay in young preschoolers

T Rihtman^{1*}, B Wilson², S

Cermak³, S Rodger⁴, A Kennedy-Behr⁵, L Snowdon⁵, M Schoemaker⁶, M Cantell⁶, S Houwen⁶, M Jover⁷, J-M Albaret⁸, S Ray-Kaeser⁹, L Magalhães¹⁰, A A Cardoso¹⁰, H Van Waelvelde¹¹, D Hultsch¹², S Vincon¹³, M Tseng¹⁴, A Pienaar¹⁵, D Coetzee¹⁵, A Nakai¹⁶, R Martini¹⁷, J Tercon¹⁸, D Green¹⁹, E Imperatore (Blanche)²⁰, J Diaz³, S Parush²¹

¹School of Occupational Therapy of Hadassah and the Hebrew University of Jerusalem, Israel; ²School of Health, Faculty of Health and Life Science, Coventry University, UK; ³Alberta Children's Hospital and the University of Calgary, Calgary, Canada; ⁴University of Southern California, USA; ⁵University of Queensland, Australia; ⁶University of the Sunshine Coast, Australia; ⁷University of Groningen, The Netherlands; ⁸Aix-Marseille Université, Aix en Provence, France; ⁹University of Toulouse III Paul Sabatier, France; ¹⁰Haute école de travail social et de la santé, Lausanne, Switzerland; ¹¹Universidade Federal de Minas Gerais, Brazil; ¹²Artevelde University College and Ghent University, Belgium; ¹³University of Gießen, Germany; ¹⁴Child Centre Maulbronn, Germany; ¹⁵National Taiwan University, Republic of China; ¹⁶North West University, Potchefstroom, South Africa; ¹⁷Hyogo Children's Sleep and Development Medical Research Center, Kobe, Japan; ¹⁸University of Ottawa, Canada; ¹⁹Community Health Centre Ljubljana & University of Ljubljana, Faculty of Education, Slovenia; ²⁰Oxford Brookes University, UK;

Introduction & Aim: Even though Developmental Coordination Disorder (DCD) is typically not diagnosed before 5 years, identification of younger preschool children at risk of DCD may mitigate secondary complications, through provision of early support. Screening tools to identify motor difficulties are needed, but instruments developed in one country may not be psychometrically sound in other cultures. This study aimed to collaboratively develop the Little Developmental Coordination Disorder Questionnaire (LDCDQ) (a screening instrument for motor difficulties in young pre-schoolers) between several countries, while ensuring numerous psychometrically sound, comparable versions of the tool. This innovative project in the field of DCD will enable analysis and comparison of different patterns of motor development and/or delay in different cultures.

Methods: Based on a similar screening instrument for older

children, the Little DCDQ was developed in Hebrew and psychometrically tested. After generating an English Little DCDQ (following recommended guidelines), 27 researchers from 17 sites adapted and psychometrically tested the instrument with their local cultures/languages. Thereafter, each collaborator used their local Little DCDQ to assess 40 children aged 3-4.11 (20 typically developing; 20 with suspected motor difficulties) following the same protocol, and data was compared.

Results: The process of the first phase of this collaboration will be briefly described and initial cross-cultural comparative results will be reported. Within most countries, significant differences in motor performance between referred and non-referred children were found. When comparing between countries, significant differences were more noticeable for non-referred than referred children; trends in high- and low-scoring means will be discussed.

Conclusion: This study has important implications for DCD research and practice. This is

the first attempt to develop an instrument with the aim of facilitating cross-cultural comparison of DCD in young pre-schoolers, which will enable

a unified language for researchers investigating typical and delayed motor development in pre-schoolers.

PARALLEL SESSION 2 ABSTRACTS

Invited International Speaker: Professor Michael Wade

University of Minnesota, Minneapolis, USA

Does current theorizing about DCD influence diagnosis and intervention?

Two dominant theories have influenced explanations of the underlying cause(s) of DCD: First, the traditional mechanistic (constructionist) view with its origins in the Cartesian notion of a brain based internal deficit, broadly referred to as a disrupted 'internal model', (Wilson & McKenzie, 1998). Second dynamical systems theory (DS) embracing both the notion of self-organization (Bernstein 1967 and Kelso, 1995), and the ecological view of perception as direct (Gibson 1979, and Turvey, 1992). Adherents to the former orientation propose that deficits such as "system noise" and/or poor "executive function" (EF) are thought to be the underlying cause(s) of the motor problems in children with DCD; the latter orientation proposes that it is poor perception- action coupling and degraded prospectivity. Both the constructionist hypothesis of EF shares a similar set of outcomes as the ecological driven notion of prospective control, namely the ability to control and act on future events. The implications for assessment, diagnosis and therapeutic intervention are discussed in the context of the extant published research for both views.

PARALLEL SESSION 3 ABSTRACTS

Evaluating interventions and support services for individuals with DCD

Oral Presentations **Day 1, 1330-1350:** *Featherstone*
 Day 1, 1350-1410: *Rihtman, Gadsby et al.*
 Day 1, 1410-1430: *TBC*

Reflections on implementing and evaluating participation-focussed practice for children with DCD

J Featherstone
Sheffield Children's NHS Foundation
Trust, Sheffield, UK

Background: Participation is often the ultimate goal for children with DCD however, actually implementing and evaluating participation-focussed practice remains a challenge for most front line therapy services.

Aim: This presentation will reflect on 10 years of implementing and evaluating participation-focussed practice in one specialist DCD service, and share lessons learned and current burning questions.

Method: We are an NHS-funded, community-based specialist DCD service in Sheffield. Between 2006 and 2015 we established a range of

participation-focussed practices for our population of children with DCD including, handwriting and football groups, rock climbing sessions and swimming focussed hydrotherapy. We supported their implementation e.g. by: fully integrating the physiotherapy and occupational therapy team; developing standardised goal recording and feedback forms; and making links with the local council's activity services. We evaluated practice through parent and child questionnaires, regular analysis of user feedback, and clinician reflection on practice.

Results: We have learned a number of lessons, including the importance of an integrated team, the influence of timing on success, and the benefits of making and maintaining links with community services. Parent and child questionnaires used

pre-, immediately post-, and months after intervention seem to be useful for evaluating impact. They show that parents feel their children are better equipped to participate immediately following interventions. Longer term evaluation of hydrotherapy sessions shows that participation in family swimming/swimming lessons has increased for some children. The burning remaining questions include how to develop and deliver these more effectively, and what other methods could be used for evaluation.

Conclusion: Reflecting on the implementation and evaluation of a participation-focussed DCD service has shown that lessons can be learned about how to do it, when to do it and who to involve. How to develop, deliver and evaluate this service more effectively however is a question yet to be answered.

Occupational Therapy Service Delivery in the UK for Children and Young People with Developmental Coordination Disorder

T Rihtman^{1*}, N Gadsby¹, C Champion¹, J Porter²

¹School of Health, Faculty of Health and Life Science, Coventry University, Coventry, UK; ²Child and Family Services, Coventry and Warwickshire Partnership Trust, UK

Introduction &

Aim: Occupational therapy (OT) service delivery is a hot topic; the referral of increasing numbers of children and young people with Developmental Coordination Disorder (DCD) continues to increase pressure for services (Horton and Hall 2008). DCD service pathways are generally inconsistent across the UK (COT 2003). Developing knowledge, skills and confidence amongst clinicians and students regarding topics of relevance to DCD is key. This study aimed to investigate the current state of OT practice with young people with DCD within the UK, whilst considering means of further development of this field.

Methods: After gaining ethical approval from Coventry University's Faculty Ethics committee, a free study day was offered to paediatric OT clinicians with experience working with children and young people with DCD, and a select number of final year OT students, with clarification that the event would be used to

gather research data. Delegates registered online and selected the teaching foci for the event. A mixed-methodological approach was adopted and a series of questionnaires was administered during and after the event to measure shifting perspectives regarding the selected foci. Focus groups gathered qualitative data regarding student and clinician perspectives.

Results: Similar challenges regarding DCD OT service provision were reported by clinicians from across different geographical areas; focused provision of information and training about issues of relevance to DCD may improve clinicians' and students' sense of confidence about addressing them. Changes in perceptions were observed during the event, suggesting that the strategies adopted in this study to investigate this area while addressing clinical and educational need may be beneficial.

Conclusion: OTs have a clear role to play in DCD diagnosis, intervention and support (COT 2008). Clarification of profession-specific issues and challenges, with educational

provision geared to address these, may provide opportunities to further OT service provision with this population.

PARALLEL SESSION 4 ABSTRACTS

Evaluating Interventions for Activities of Daily Living

Oral Presentations **Day 1, 1330-1350:** *Barnett & Prunty*
 Day 1, 1350-1410: *Roberts*
 Day 1, 1410-1430: *Preedy & Duncombe*

Teaching bike-riding skills in a community setting: Perspectives of trainers and parents

A L Barnett¹ & M Prunty²

¹Oxford Brookes University, Oxford, UK; ²Brunel University, London, UK

Background: Children with DCD struggle to learn the motor skills required for participation in leisure and physical activities. This can negatively impact on their self-esteem, peer relationships and physical health. Riding a bike is a popular activity among children as well as offering a potential source of moderate-intensity activity. The aim of this preliminary study was to describe the content of a community bike-riding course designed for children with movement difficulties and provide a qualitative evaluation from the perspective of trainers and parents.

Methods: Nine children with

movement difficulties (aged 5-15 years) took part in a community course (2 hours/day for 5 days) designed to teach bike-riding. Parents rated the skill level of their child at the start and end of the course. Semi-structured interviews were conducted with five trainers and four parents, asking them to describe aspects of teaching and learning and to seek their views on the approaches used in the course and outcomes for the children. The interviews were transcribed and subjected to categorical-content analysis.

Results: At the start of the course none of the children could ride a bike but at the end, eight pedalled independently and one could pedal with some adult support. Trainers and parents identified various positive aspects of the course including: the safe environment, good interpersonal skills of the

of the trainers, encouragement & praise for achievements, breaking bike-riding down into the constituent parts, and learning from observation.

Conclusions: The bike-riding course followed sound principles of motor learning and demonstrated that children with movement difficulties can acquire complex motor skills given an appropriate teaching environment. Specific elements of good practice identified here should be disseminated for application in future courses to allow non-professionals to deliver effective teaching in a community setting to help children with movement difficulties learn to ride a bike.

Overcoming barriers to participation in swimming and bathing for children with Developmental Coordination Disorders (DCD) and Autism Spectrum Disorders (ASD)

J Roberts
The Ryegate Children's Centre,
Sheffield, UK

Background: Children with DCD and ASD with motor and/or sensory impairments often identify swimming and bathing as therapeutic goals.

Fear of water and/or an inability to make progress in community-based swimming lessons are frequently cited by the child or their parents as barriers to participation. A therapy-led clinic using a hydrotherapy pool setting was established in 2013 with an aim of improving participation in swimming and bathing in these patient groups.

Aims: To evaluate the effectiveness of a 1:1 hydrotherapy pool based intervention on participation in bathing, swimming lessons and family swimming for children with motor and/or sensory impairments.

Method: Children were referred over a 6 month period. Therapy involved 1:1 sessions in the hydrotherapy pool and shower area with an experienced physiotherapist. Outcomes included the child's experience using a smiley face rating scale, and a six month follow up parent questionnaire.

Results: Eighteen children aged between four and thirteen attended the clinic for an average of five 1:1 sessions (75 sessions in total), each lasting 45 minutes. Criteria included an inability to make progress with swimming lessons and water phobia affecting bathing.

Children rated 73/75 sessions as “It helped me lots”. Six parent questionnaires were returned (33% response rate). Results from the parent questionnaire showed that six months after the sessions, children were attending swimming lessons (4/6), or regularly swimming with family (4/6) and progressing through swimming awards (3/6). Water phobia was completely resolved with age appropriate bathing achieved (4/6).

Conclusion: Participation in swimming and bathing is important to children with motor and/or sensory impairments. Difficulty making progress and water phobias act as barriers to participation. These barriers can be overcome in a short period of time with 1:1 therapy, based in a hydrotherapy pool setting alongside an experienced therapist. Long term outcomes show that participation continues beyond the therapeutic setting.

Physical (Under)Development in the EYFS?

P Preedy¹ & R Duncombe²

¹independent consultant; ²School of Sport, Exercise & Health Sciences, Loughborough University, Loughborough, UK

Amidst recent and growing concerns regarding the quantity and quality of physical activity in young children (e.g. BHF, 2015), the potential relationship between insufficient early movement experiences and a number of undesirable educational, physical and behavioural outcomes, as an area of study, is becoming increasingly important. The research presented here is part of a larger study that aims to develop and evaluate a programme of specific whole-class, school-based exercises designed to compensate for this. The data under discussion focus on the baseline physical development tests conducted prior to the implementation of this programme. Fifty-seven children (aged four and five), from two schools in England completed these tests, which included the Movement Assessment Battery for Children-2 (Henderson, Sugden & Barnett, 2007) and the Institute for Neuro Physiological Psychology (INPP) Developmental Screening Test (Goddard-Blythe, 2012). The findings from both tests reveal that these young children are starting school with lower than expected levels of physical development. For example,

48% of these children, for whom it was possible to obtain a total test score on the Movement ABC-2, were classified as having or being at risk of having a movement difficulty. Likewise, the INPP tests revealed that over half of these young children had some degree of neuromotor immaturity. Bearing in mind the socio-economic make-up of the two schools (one independent school and one state school in an area of high socio-economic status), these results were especially surprising. Thus, the findings are discussed in relation to: possible shortfalls in the physical development strand of the Early Years Foundation Stage (EYFS), which was implemented in its current format in 2014; insufficient parental education in relation to the importance of appropriate movement experiences in the early years; and children's developmental readiness for learning.

PARALLEL SESSION 5 ABSTRACTS

Supporting the development of children with coordination difficulties

Oral Presentations **Day 2, 1100-1120:** *Preston et al.*

Day 2, 1120-1140: *Crawford*

Day 2, 1140-1200: *V. McQuillan et al.*

A systematic review of high quality randomised controlled trials investigating motor skill programs for children with Developmental Coordination Disorder

N Preston¹, S Magallón^{1,2}, E Andrews³, S M Ahern³, L J B Hill¹, M Mon-Williams¹

¹School of Psychology, Faculty of Medicine & Health, University of Leeds, Leeds UK; ²Department of Learning & Curriculum, Faculty of Education & Psychology, University of Navarre, Spain; ³Bradford Institute for Health Research, Bradford Teaching Hospitals NHS Foundation Trust, Bradford, UK

Objective: To identify effective motor training interventions for children with Developmental Coordination Disorder from research graded as high quality (using objective criteria) for the purpose of informing evidence-based clinical practice.

Data sources: We followed the

guidance for conducting systematic reviews issued by the Centre for Reviews and Dissemination. Six OvidSP electronic databases (AMED, All EBM reviews (including Cochrane), Embase, Ovid MEDLINE, PsychARTICLES Full Text, PsycINFO) were searched systematically. We aimed to retain only randomized control trials and systematic reviews of randomized control trials, defined as the highest level of evidence by the Oxford Centre for Evidence-Based Medicine. We searched reference lists of retained articles to identify further appropriate articles.

Review methods: Two reviewers critically appraised and categorized articles by effect size (including confidence intervals), inclusion of power calculations and quality using the Physiotherapy Evidence Database (PEDro) scale. Only studies scoring seven or more on the PEDro scale (classed by

the PEDro as high reliability) were retained.

Results: No systematic reviews met our criteria for inclusion from 846 papers yielded by the systematic search. Nine RCTs investigating 15 interventions to improve motor skills met our inclusion criteria for 'high quality'. Nevertheless, not all included studies were adequately powered for determining an effect.

Conclusion: Large effect sizes associated with 95 per cent confidence intervals suggest that 'Neuromotor Task Training', 'Task-oriented Motor Training' and 'Motor Imagery + Task Practice Training' are the most effective reported interventions for improving motor skills in children with Developmental Coordination Disorder.

Mobile digital technology, fundamental movement skills, DCD intervention

S Crawford

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The use of mobile digital technology programmes are now being promoted for addressing fundamental movement skills of children and adults. This presentation will demonstrate how mobile digital technology can

mobile digital technology can incorporate visual, aural, written instruction and incidental teaching and learning opportunities for children with DCD to assist in the development of their fundamental movement skills. The programme can be used by stakeholders to include children with DCD, parents, practitioners' i.e. occupational therapists, physiotherapists in conjunction with hands on support. It is further proposed that the programme will be evaluated by stakeholders who will provide qualitative feedback initially on the efficacy of the programme content and approach followed by formal quantitative testing thereafter.

Stability and change in Developmental Coordination Disorder

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Background: Children with DCD present a variety of motor impairments and many have associated characteristics causing other difficulties. The impact on their activity and

participation in a number of settings can have long-term detrimental effects. Growing evidence about DCD has led to new guidelines for identification and intervention. However, more detail is required about the different profiles of children with DCD and whether they progress differently over time.

Aim: To investigate the motor and associated characteristics of children with DCD and compare them to those of typically developing children as they progressed over time. A second aim was to examine the relationship between their characteristics, their context and their experiences of participating in physical and everyday activities over time.

Methods: Thirty-four children attending mainstream school were included in the study (29 boys and 5 girls, aged from 7-14 years). Their family context was noted and a profile of their motor characteristics, characteristics of their attention, their communication and their IQ was established. The progression of their motor ability was repeatedly measured over two academic years and the children were questioned about their participation in leisure and

physical activity at each assessment.

Results: The children showed wide variability over time, but six categories of motor and other characteristics arose, some with changing and some with stable profiles. A noticeable high prevalence of DCD with associated characteristics emerged, but stability of the profiles varied according to the severity of motor impairment. Children's perceptions about engaging in physical activity were not always related to motor ability.

Conclusions and implications: Differences between the six categories related to associated characteristics, family context and preference for participation in physical activity as well as to motor ability. Understanding and addressing these differences through intervention may enhance participation in physical activity among children with DCD

PARALLEL SESSION 6 ABSTRACTS

Investigating perceptual and attentional deficits in DCD

Oral Presentations: **Day 2, 1100-1120:** *Sumner et al.*

Day 2, 1120-1140: *Corbett, Atkinson & Braddick*

Day 2, 1140-1200: *Job et al.*

Oculomotor Atypicalities in Developmental Coordination Disorder

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Aim: Children with Developmental Coordination Disorder (DCD) present with significant problems with motor planning and control. Given that completion of motor tasks relies heavily on accurate visual feedback, surprisingly little is known about the integrity of the oculomotor system in DCD. The aim of this study was to determine whether oculomotor differences can distinguish between children with and without DCD.

Method: Twenty-three children, aged 7-10 years who met the formal diagnostic criteria for DCD (DSM-5) were compared to two typically developing

groups: the first was matched by chronological-age (CA; $n = 25$), while the second was a motor-matched (MM; $n = 29$) group aged 4-7 years. Eye movements were recorded using Eyelink 1000 (SR-research) as children completed four tasks: visual fixation, smooth pursuit (i.e., tracking a target), and prosaccade and antisaccade (i.e., inhibiting a reflexive saccade) tasks.

Results: Pursuit gain and response preparation in the pro- and anti-saccade tasks were comparable across groups. Compared to age controls, children with DCD had deficits in maintaining engagement in the fixation and pursuit tasks, and made more anti-saccade errors. A high number of intrusive saccades, taking the eye away from or ahead of the target, were made by children with DCD during the fixation and pursuit tasks. Children with DCD also demonstrated more

pronounced difficulties with maintaining attention on the pursuit tasks than the younger MM group.

Discussion: The findings suggest that children with DCD have problems with saccadic inhibition and maintaining attention. This study adds to the literature by being the first to employ a range of eye tracking measures in the same study to assess key oculomotor skills (fixation stability, saccades, pursuit); and systematically identifies specific differences between children with and without a motor impairment. Further examination of oculomotor control may help to identify underlying processes contributing to DCD.

Impaired visual form and motion sensitivity in children with DCD

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Impairments in visual motion sensitivity and motor competency often co-occur in developmental disorders. DCD is characterised by poor motor

competency but reports of visual motion sensitivity status in children with DCD are contradictory (Wilmot & Wann, 2008; Sigmundsson et al., 2003; O'Brien et al., 2002). The current study examined visual motion sensitivity in 5-15 year olds with and without DCD.

Seventy-three typically developing children and 20 children diagnosed with DCD were assessed. Children were asked to detect a signal patch in noise, which could appear left or right of screen centre. Separate runs comprising dynamic (motion) or static (form) rotary dot patterns were presented with an adaptive staircase to modulate pattern coherence and obtain estimates of motion and form sensitivity.

Form and motion sensitivity improved linearly with verbal mental age (measured using the BPVS-2) for both groups ($p < 0.001$). Children with DCD had reduced form and motion sensitivity ($p < 0.050$) with greater variability in motion relative to form sensitivity. A between-groups comparison of younger (5-9 years old) and older (10-15 years old) children showed that younger children with DCD had a selective motion deficit ($p < 0.001$). Older children with

DCD showed a more general developmental delay, with poorer form and motion sensitivity. Furthermore, motor ability and form and motion sensitivity were significantly related in the DCD group ($p < 0.030$) but not the typically developing group ($p > 0.100$).

In summary, children with DCD have impaired motion and form sensitivity even when mental age and chronological age were equivalent across groups. The dorsal stream likely mediates this relationship between poor visual motion and form sensitivity and poor motor competency. In an analogous visuomotor task, participants reached out and touched the centre of these static or dynamic patterns. We report coherence thresholds from this task to explore this interaction between motor ability and form and motion sensitivity further.

Spatial selection during movement preparation in adults with and without Developmental Coordination Disorder: An electrophysiological investigation

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Recent investigations reveal a deficit in visual-spatial attention in developmental coordination disorder (DCD). Control mechanisms of spatial attention and movement preparation are increasingly considered inseparable, as both act to bias sensory processing at task-relevant locations in space. Here, the top-down control of sensory processing at goal locations of reaching movements is investigated in a group of adults with DCD as well as matched controls. Neural activity is recorded using electroencephalography (EEG) to assess the underlying mechanism of how movement preparation biases sensory perception of space, and whether these mechanisms differ in adults with DCD. A movement task cues participants to prepare reaching movements towards different goal locations in front of them as well as on the body surface. During movement preparation, visual and tactile processing is assessed using probe stimuli at movement goal locations. Event-related

potentials (ERPs) elicited by these visual and tactile probe stimuli reveal top-down modulations of incoming sensory information by movement preparation. Compared to matched controls, adults with DCD showed enhanced modulations of visual perception at the goal of an upcoming movement. However, controls showed greater modulations of tactile perception at the goal of movements towards unseen personal space. These results suggest adults with DCD have an over-reliance on visual information during movement preparation and selectively bias action relevant locations differently from controls

PARALLEL SESSION 7 ABSTRACTS

Exploring the nature of co-occurring difficulties in children with coordination difficulties

Oral Presentations **Day 2, 1330-1350:** *LJB Hill et al.*
 Day 2, 1350-1410: *Li et al.*
 Day 2, 1410-1430: *EL Hill, Sumner & Pratt.*

The relationship between manual coordination and mental health

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Background: Motor coordination impairments frequently co-occur with other developmental disorders and mental health problems in clinically referred populations. But does this reflect a broader dimensional relationship within the general population? A clearer understanding of this relationship might inform improvements in mental health service provision. However, ascertainment and referral bias means that there is limited

value in conducting further research with clinically referred samples.

Aim: We, therefore, conducted a cross-sectional population-based study investigating the relationship between children's manual coordination and their mental health.

Method: To measure manual coordination we used an objective computerised test (CKAT) and related these measures to teacher-completed responses on a behavioural screening questionnaire [the Strength and Difficulties Questionnaire (SDQ)]. We sampled 298 children (4–11 years old; 136 males) recruited from the general population.

Results: Hierarchical (logistic and linear) regression modelling indicated significant categorical and continuous relationships between manual coordination and overall SDQ

score (a dimensional measure of psychopathology). Even after controlling for gender and age, manual coordination explained 15% of the variance in total SDQ score. This dropped to 9% after exclusion of participants whose SDQ responses indicated potential mental health problems.

Conclusion: These results: (1) indicate that there is a clear relationship between children's motor and mental health development in community-based samples; (2) demonstrate the relationship's dimensional nature; and (3) have implications for service provision.

Developmental Coordination Disorder, physical and mental health in preschool children: A preliminary analysis

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Background & purpose:

Preschool children at risk for Developmental Coordination

Disorder (DCD) are more likely to experience internalizing problems, such as depression and anxiety, than typically developing preschoolers. Currently, the underlying mechanisms resulting in increased internalizing problems in DCD remains unknown; however, a previous study based on the partial Environmental Stress Hypothesis suggests that physical inactivity and obesity may mediate the relationship between DCD and internalizing problems. There remains a lack of direct evidence verifying this hypothesis; therefore, the purpose of this study is to investigate the relationships between DCD, internalizing problems, physical activity, and BMI based on the partial Environmental Stress Hypothesis.

Methods: Young children enrolled in the Coordination and Activity Tracking in Children (CATCH) study comprise the sample (n=211), of which, 110 (76 boys, 69.1%) were classified as at risk for DCD (rDCD) with a score at or below the 16th percentile on the Movement Assessment Battery for Children – Second Edition. Physical activity was measured using

accelerometers, while the Child Behavior Checklist was used to rate internalizing problems.

Results: There was a significant direct effect of rDCD on internalizing problems ($b=2.67$, $B=0.225$, $p<0.01$; adjusted $R^2=0.045$), where children with rDCD were more likely to have internalizing problems. Physical activity and BMI did not mediate the relationship between rDCD and internalizing problems.

Conclusion: The findings from this study further support co-occurring internalizing problems in children with DCD, and extend these findings to demonstrate that this relationship is not explained by physical activity or BMI in preschool child. Future research should be directed towards other psychosocial factors incorporated in the Environmental Stress Hypothesis to better understand the underlying mechanism between DCD and co-occurring internalizing problems.

Examining the Cognitive Profile of Children with Developmental Coordination Disorder

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Aim: Although primarily a motor disorder, research considering a range of cognitive abilities in children with Developmental Coordination Disorder (DCD) is relatively scarce. This is despite the knowledge that children with DCD often struggle academically. The present study aimed to produce a detailed characterisation of the IQ profile of children with and without DCD and to identify whether children with DCD exhibit any specific cognitive weaknesses in this respect.

Method: Fifty-two children (mean age, 9 years) that met the formal diagnostic criteria for DCD (DSM-5) were matched to 52 typically-developing children by age and gender. Motor competency was examined in both groups using the Movement Assessment Battery for Children (MABC-2). Cognitive ability was assessed using the Wechsler Intelligence Scale for Children (WISC-IV), which comprised ten tasks linked to four key indices: verbal comprehension, perceptual reasoning, processing speed, and working memory.

Results: As a group, children with DCD performed poorer than their peers on the processing speed and working memory measures of WISC-IV. Individual analyses revealed varied performance in the DCD group across all cognitive indices, despite displaying Full-Scale IQs in the typical range. Discriminant function analyses show processing speed and working memory performance predicted only 23% of between-group variability.

Discussion: Children with DCD present with a heterogeneous cognitive profile. Since DCD is diagnosed on the basis of motor difficulties, these should be a central component of consideration in both research and when designing educational assistance plans, along with an individual child's cognitive profile. These findings lend support to individual case analyses in research. Moreover, the motorically-demanding nature of the WISC-IV processing speed tasks raises specific concerns about IQ assessment in this population. The implications of these findings for research, education and the diagnostic process are raised.

PARALLEL SESSION 8 ABSTRACTS

Communication and executive function deficits in children with coordination difficulties

Oral Presentations **Day 2, 1330-1350:** *Bernardi et al.*
 Day 2, 1350-1410: *Leonard, Sumner & EL Hill*
 Day 2, 1410-1430: *Magallón et al.*

The development of executive function in children with Developmental Coordination Disorder and motor difficulties: a longitudinal study

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Aim & Methodology: The study aimed to investigate the development of executive function (EF) in children with poor motor skills. Screening measures of intellectual abilities, language, reading and motor skills were administered to a group of 7-11 year olds. Included children (N=51) completed a comprehensive assessment battery of EF, which consisted of a verbal and a nonverbal

measure of all the following EFs: executive-loaded working memory, fluency, response inhibition, planning, and switching. Typically developing children (TD: *n*=17) were compared to those with a clinical diagnosis of DCD (*n*=17) and those with motor difficulties (MD: *n*=17), who were screened for motor impairments but had no diagnosis of DCD. Two years later children were followed up and repeated all screening and EF assessments.

Results & Discussion:

Hierarchical multiple regressions revealed that at Time 1 children with DCD and MD had significantly lower scores than TD children on all nonverbal EF tasks, except switching for the MD group. Two years later, children with MD demonstrated significant gains in their planning and inhibition abilities, which seemed to reach maturity and

compensate for differences in comparison to the TD group. Despite improvements were detected in children with DCD, their EF profile did not change, as all nonverbal EFs and verbal fluency remained significantly poorer than TD children. Effective intervention and support for children with poor motor skills need to address EF deficits, which seemed to persist across childhood and are likely to have an impact on academic achievement and activities of daily living. Further longitudinal research is needed to clarify whether impaired EF domains reach maturity at a later time during development in children with poor motor skills.

Motor and social functioning in Developmental Coordination Disorder: a cross-syndrome comparison with Autism Spectrum Disorder

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Background and Aim:

Developmental coordination disorder (DCD) and autism spectrum disorder (ASD) are

diagnosed as discrete disorders, but often share overlapping features; social difficulties are reported in DCD, while motor problems are increasingly evident in ASD. The current study adopted a cross-syndrome design in order to assess the overlap of these symptoms in children with ASD and DCD, compared to typically-developing (TD) controls.

Methods: The sample consisted of 30 children with ASD, 30 children with DCD, and 35 TD age-matched controls (all aged 7-10). Children completed motor and face processing assessments, and parents completed questionnaires concerning their child's early motor and current motor and social abilities.

Findings: Retrospective parent reports of early motor milestones suggested that children in both the DCD and ASD groups crawled, stood and walked later on average than TD controls, although this effect was significant only in the DCD group. More than half of the ASD group met the cut-off for motor difficulties used to identify those with DCD, and the DCD group scored at a similar level to the ASD group on experimental and standardised measures of face processing. Furthermore, motor

skill was a significant predictor of parent-reported socialisation in both the ASD and DCD groups.

Discussion: Although children with ASD and DCD remain distinct in the severity of their core symptoms, relationships between social and motor skills are evident in both disorders. The identification of early motor difficulties could therefore provide opportunities for intervention.

Use of the Spanish adaptation of the Children's Communication Checklist to differentiate between pragmatic language difficulties in Developmental Coordination Disorder and other developmental disorders

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Background: Children with Developmental Coordination Disorder (DCD), Social (Pragmatic) Communication Disorder (SCD), Autism Spectrum Disorder (ASD), and Attention-Deficit/Hyperactivity

Disorder (ADHD) commonly present with difficulties in pragmatic language skills. The Spanish version of the Children's Communication Checklist (CCC) has shown high validity and reliability in assessing these pragmatic language skills (conversational abilities, coherence-comprehension, empathy, non-verbal communication and appropriateness), as well as social relationships and interests.

Aim: To examine the feasibility of the Spanish version of the CCC to distinguish between the pragmatic, social relationships and interests problems associated with DCD and those related with SCD, ASD and ADHD.

Method: Parents of 200 patients of the Paediatric Neurology unit of the University of Navarre Hospital, Spain (4-12 year old; IQ within average), were asked to complete the Spanish version of the CCC. The sample comprised 4 clinical groups: DCD (n=77), SCD (n=25), ASD (n=30) and ADHD (n=68). Characteristics of the communication skills of each group were described. An ANOVA was conducted to explore potential differences between groups. In addition, a discriminant analysis was conducted to study the feasibility of the use of the CCC.

to classify participants in the different experimental groups.

Results: With the exception of the children with ADHD who obtained an average score in non-verbal communication and social relationships, all patients showed low scores on the pragmatic language components and social relationships. However, differences between groups were found depending on the severity of the pragmatic difficulties (ADHD < DCD < SCD = ASD) and on the presence of certain unique communication skills characteristics: compared to the other clinical groups, children with DCD showed higher levels of interaction with non-familiar adults, were too literal in their understanding of language, displayed more variable communication ability depending on the context, and showed more expressions and gestures which were incongruent with their feelings. However, participants with DCD showed better coherence-comprehension skills than children in SCD and ASD groups. The ASD group showed poorer performance than the other 3 groups on the interests component. Discriminant analysis revealed that the CCC correctly classified 78% of the participants to their experimental groups.

Conclusion: The Spanish version of the CCC is useful to distinguish between the pragmatic difficulties associated to DCD and those related with SCD, ASD and ADHD.

POSTER PRESENTATIONS – DAY 1

A reflective case review: Re-learning handwriting after a traumatic brain injury (TBI)

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Handwriting is a common reason for referral and identified as a meaningful occupation by children referred to community services but features less frequently for children in rehabilitation.

Aim: This case study reflected on a child's journey following a TBI to re-learn handwriting, a previously meaningful occupation.

Participants: 14 year old Sue (pseudonym) with right hemiplegia (previously right dominant).

Methodology: A retrospective, single case-study. Goals were set with Sue using the Canadian Occupational Performance Measure (COPM) and Goal Attainment Scale-light (GAS). Other outcome measures included handwriting samples and Assessment of Motor and Processing Skills (AMPS). An evidence based occupational therapy intervention programme of 12

weeks of 30 minute sessions was devised and administered based on Sue's goal to re-learn to write with her right hand. Consent was gained from Sue and her mother. Approval was granted by The Children's Trust Research Committee.

Results: Sue was able to re-learn to write using her right hand. GAS showed clinically significant improvement; at "a lot more than expected" level. AMPS showed motor improvement but the processing score remained the same (Admission: Motor= -0.04 (below average); process=0.54 (low average). Discharge: Motor= 1.48 (low average) Process= 0.54 (low average). COPM scores did not reach significance; Admission= 0 Discharge=1 both for performance and satisfaction. Handwriting samples show letter size significantly reduced with improved formation. Sue's awareness and pre-morbid identity influenced self-evaluation and she perceived limited improvements. Mother perceived a significant improvement in handwriting. Sue re-learnt to write with her dominant hand despite her

hemiplegia within 12 weeks, a surprisingly short time. She made significant improvement in her handwriting (size/letter formation/spacing) as judged by her therapist and mother. However, Sue's COPM did not reach clinical significance.

Sensorimotor processing and educational attainment

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There is convergent evidence that sensorimotor processes play a crucial role in cognitive development and educational success. In clinical populations, motor problems frequently co-occur with language and mathematics difficulties, and population based studies have suggested relationship between ability on motor tasks and educational attainment. Nevertheless, it remains unknown whether there is a general dimensional

relationship between sensorimotor control and attainment, since clinical populations are subject to referral and ascertainment bias whilst existing population based studies have not used measures capable of isolating sensorimotor control. We conducted the first exploration of the links between distinct sensorimotor control processes (indexed by objective kinematic measures) and educational attainment, conducted in a group of 381 primary school children (5-11 years old). A predictive relationship was found, suggesting sensorimotor processes provide a foundation for the acquisition of higher order cognitive skills. This result supports the notion that neuroscience might contribute to educational theory.

Moving in an unpredictable environment: a description of the behaviour of individuals with Developmental Coordination Disorder (DCD)

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Background: As part of everyday life we negotiate obstacles as we move around; often these may appear suddenly and block our

pathway. Typically developing individuals can make quick and adaptive adjustments which are tailored to a particular situation. In contrast, individuals with DCD are known to bump into and trip over obstacles in their pathway; however, exactly how they navigate unexpectedly appearing obstacles is unknown.

Design: The current study considered how individuals with DCD circumvent an unexpected obstacle appearing in their pathway.

Methods: Twenty-nine individuals with DCD (7-32 years) and 29 age and gender matched controls took part. Participants were split into three age groups. Participants walked down a 10m track at a comfortable pace 36 times. On 17% of trials an obstacle unexpectedly appeared in the pathway forcing the participant to adjust their movement to avoid collision. A 16 camera VICON motion capture system was used to record movement of the feet and the trunk during each trial. Patterns of foot placement were also recorded.

Results: When an obstacle appeared individuals with DCD started an avoidance strategy

sooner than their peers and their path deviation was greater than their peers. In addition, individuals with DCD showed a very different foot placement strategy than their peers. Participants with DCD followed the same developmental trajectory as the TD participants

Conclusions: In a controlled environment such as this the strategy used by individuals with DCD, to slow more and adjust a greater number of times, did not result in collision. However, in a fast moving environment, such as a busy street this slow strategy may not be appropriate.

Appropriateness of Road Safety Education for Children with Developmental Coordination Disorder (DCD)

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Aim: The need to teach children how to safely cross the road is widely accepted (e.g. Connelly et al., 1998), it is however unclear whether children with DCD benefit from the current educational methods of delivering road safety interventions. Traditionally, educational

interventions have included both allocentric and egocentric approaches, specifically: Tufty the road safety RoSPA squirrel (allocentric); Tales of the Road (allocentric) and Kerbcraft (egocentric). The aim of this study was to investigate whether current pedagogical approaches to teaching road safety in primary and secondary schools successfully up skill children with DCD. In addition, this study explored whether competence or confidence in road crossing ability prohibits children with DCD in benefiting from safe routes in the community's initiatives.

Method: Children (101 typically developing, 34 at risk of DCD and 23 DCD) were presented with a series of computer based virtual reality road crossing scenarios, from both an allocentric and egocentric perspective. The child's task was to navigate either 'themselves' or an avatar across each road by identifying the safest crossing route. The number of safe crossings and deviation from the pavement were measured. In addition, children were asked whether they had completed any road safety education at school and how confident and competent

they were at executing a safe road crossing.

Results: As might be expected the number of safe crossings for the typically developing children increased with age in both the allocentric and egocentric conditions. However, for children at risk of DCD and children with DCD the number of safe crossings remained relatively stable in both allocentric and egocentric conditions across ages. Likewise, deviation from the pavement (RMSE) improved with age for the typically developing children and children at risk of DCD, but this improvement was not evident for children with DCD. These results cannot be explained by for example, road crossing exposure as children with DCD and at risk of DCD reported similar road crossing experiences as their peers.

Discussion: These findings suggest that in line with previous research children with DCD or children at risk of DCD may need longer to practice skills and the teaching of road safety could benefit from a greater understanding of the effectiveness of different pedagogical approaches for different learners.

Dyspraxia In The Workshop (Work in Progress)

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Little is known about how DCD (also known as Dyspraxia in the UK) influences artists and craft practitioners. This research explores the impact DCD has on applied artists, specifically those working with metal, and their craft practices. The research is a qualitative study, carried out in the form of in depth case studies. It comprises of an autoethnographic case study alongside six studies with DCD participants. Case studies are conducted with attention to detail and a holistic approach to the individual's life history together with exploring how DCD traits have had an impact on their craftwork practices.

Preliminary findings indicate that difficulties such as regulation of grip pressure, tool accuracy, body awareness and posture control may lead to atypical workshop practices. Additional difficulties with executive function can result in compensatory or avoidance coping mechanisms that can be counterproductive to the overall success of the creative

process. The research investigates whether the relationship to the work becomes more intuitive and less cognitively measured. When working in this intuitive manner with materiality, is distractibility reduced compared with concentrating on other forms of academic work.

This research, which is a work in progress, will contribute to knowledge of DCD and provide insight into its bearing on the applied arts and can be applied to DCD in adulthood in general. I hope that the research will provide more data to contribute to advancements in supporting children and adults with DCD, especially but not solely in art and design. I am approaching this research from the perspective of a person with DCD who is an applied arts practitioner.

Level of Information about Developmental Coordination Disorder among Slovene Physicians and their Medical Practice

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Aim: The developmental coordination disorder (DCD) is a neurodevelopmental disorder, which is still vastly under-recognised. Physicians in the Slovene public health system are the first in line to screen for probable DCD in the children in their care. The aim of this research was to study the level of information about DCD and their practice with DCD among Slovene physicians.

Methods: An on-line 28 items questionnaire about DCD was sent to all physicians in the public health system institutions. Responds were given by 81 physicians.

Results: Most of the physicians who participated in this study had some, but not detailed knowledge about DCD. In their opinion, developmental paediatricians are the first to give DCD diagnosis, followed by SEN teachers, occupational therapists and child psychiatrists. They would send their patient with suspected DCD to a specialist, either to the developmental practice, the paediatric clinic or to educational support at school. They would expect most support from occupational

therapists, SEN teachers and physiotherapists. Less than half of the responding physicians knew that DCD is a life-long neurodevelopmental disorder with high comorbidities with other disorders. In preschool children with suspected DCD, they would mostly notice clumsiness, avoidance of movement games and difficulties in activities of daily living (ADL). In school-aged children and adolescents, they would notice motor difficulties, especially in graphomotricity, perceptual difficulties and difficulties in ADL, but would pay less attention to probable secondary difficulties such as behavioural and emotional difficulties or difficulties in school.

Discussion: The research showed lack of understanding among Slovene physicians that DCD is a life-long diagnosis, with high comorbidity with other developmental disabilities, and that it can lead to secondary difficulties. All of which indicates to an under-estimation of DCD's impact on individuals' lives, hence more education about DCD should be offered to Slovene physicians.

POSTER PRESENTATIONS – DAY 2

Timing behaviour in children and its relationship to mathematics

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Theories of embodied cognition suggest that the ability of humans to perform abstract mathematics is grounded in sensorimotor interactions with the environment. Consistent with this viewpoint is the finding that motor skills can predict children's mathematics attainment. Interceptive timing is a fundamental skill involved in many sensorimotor tasks, yet it is not understood how this ability develops in children. It may be that understanding how objects move through space and time underpins abstract representations of quantity and time. To test this hypothesis, we took objective measures of interceptive timing abilities in 440 primary school children (aged 4-12). Children were instructed to hit 54 virtual moving targets that varied in size and speed using a 1-DoF

manipulandum to control an onscreen bat. Using Bayesian estimation techniques, we found that interceptive timing uniquely predicted mathematics attainment even after controlling for general motor skills and age. For every 5 targets hit the probability of achieving a mathematics attainment score above the school year group average increased by ~4%. This finding is consistent with theories that suggest sensorimotor processes are fundamental to mathematics abilities.

Central coherence and pragmatic language in children with Developmental Coordination Disorder

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Neuropaediatric Department, CUN,
Spain

Introduction: Movement clumsiness has gained increasing recognition as an important condition for children with Developmental Coordination Disorder (DCD) but other difficulty areas of these children like central coherence or pragmatic language have been less

studied. There are not many evaluation instruments and intervention activities to improve these difficulties.

Aim & Methods: One of the aim of this study is the description of the central coherence and the pragmatic difficulties children have with regard to academic literature. The other aim is to describe the test and batteries to evaluate both areas and task and activities to the intervention.

Results: There are a number of evidences which demonstrate children with DCD have difficulties in understanding quickly, consistency or inconsistency of a complex material and specific difficulties to describe verbally. The rapid, simultaneous and consistent understanding of images or complex scenes, which are part of the DCD neuropsychological profile are detectable by different test and batteries. These children have affected the verbal central coherence and has difficulties with double meanings, figurate language, irony, jokes or to integrate the information into a coherent set of knowledge.

In the study, a literature review of the test and batteries has been made to evaluate both

areas. We have been extracted different tasks of: WISC-I, Children's Communication Checklist (CCC-2), Evaluation of communication and language (ECOL) and Quick pragmatic assessment protocol (PREP).

Conclusion: We have proposed several activities, tasks and assignments to work with these children both areas to improve their abilities. This intervention can contribute to develop the pragmatic competence of these people as well as to improve their quality of life and to have more successful social progress.

Is it Magic?! A 'Wizard Group' for Improving Engagement in Handwriting for Children with Developmental Coordination Disorder (DCD)

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Sheffield Children's NHSFT, Sheffield,
UK

Background: Handwriting is frequently cited as a key area of difficulty for children with DCD, (Magalhaes, Cardoso & Missiuna, 2011). Problems with handwriting can impact negatively on academic performance and can lead to poor self-esteem, (Feder & Majnemer, 2007). Parents often

report that their children have disengaged with writing altogether.

Aim: To evaluate the effectiveness of a handwriting group for children with motor coordination difficulties, aimed at improving their participation in writing.

Method: A group was run as a wizard school, with Waldorf Wizard, (a puppet), as the leader. The group ran for four sessions. Children were Waldorf's students and during each session they learned 'magic skills' to develop their handwriting.

Alongside the wizard school, parents attended workshops with a therapist to help them to understand more about their children's difficulties and how to support them at home.

At the end of the sessions, parents were given a questionnaire to rate any subsequent changes in their children's attitude towards participating in handwriting, and how useful they themselves had found the workshops.

Results: Results of questionnaires gathered from four groups, each with six participants, were evaluated. Parents were asked to report if

they felt their children's attitude towards handwriting had changed over the four weeks. Thirteen parents reported "yes - much more positive" (54%); ten reported "yes - a little more positive" (42%), and one reported "no change" (4%). Parents also rated how useful they found the workshops. Twenty-four parents reported the workshops as being "very helpful" (100%).

Conclusions: Attendance at a handwriting group aimed at improving engagement can help children with motor coordination difficulties to develop a more positive attitude towards handwriting. Equipping parents with improved understanding of their children's challenges and knowledge on how to support them is an important part of this process.

"Fit to Learn" an in-school intervention programme for children with coordination problems, a pilot study

H Angilley
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Physiotherapist, Leeds, UK

Aim: To evaluate the feasibility of an in school intervention programme for children aged 4-7yrs with coordination problems, carried out by

trained teaching assistants.

Background: Without intervention, children with coordination difficulties do not improve. Referral to health services means missing school and therapy provision for this group of children is patchy across the UK. An in-school programme reduces the need to attend a clinical environment, is carried out in a familiar place with minimal time lost from classroom activities. The use of teaching assistants makes it low cost.

Method: A regular in-school programme was delivered to 35 children in 10 Wakefield schools for 6 weeks. The programme "Fit to Learn" was already in use in 80% of Wakefield schools. Teachers selected children with motor coordination difficulties and teaching assistants received training in the use of the Movement ABC checklist, the Strengths and difficulties Questionnaire (SDQ) and the DSMV criteria. The children were tested by an independent therapist before and after the intervention. One group had a further test after a third period of non-intervention. The schools were assigned to one of 3 groups: Group A - 6 weeks intervention, test, 6

weeks non-intervention; Group B – 6 weeks non-intervention, test, 6 weeks intervention; Group C – 6 weeks non-intervention, test, 6 weeks non-intervention

Results: Checklist scores for group A improved after intervention and deteriorated slightly after a period of non-intervention. Group B's scores were static during the period of non-intervention, improving after intervention, group C's deteriorated steadily over the study period.

MABC2 scores: The groups receiving the intervention showed an improving trend in the period of intervention, however there were sustained improvements in one school group.

Discussion: The consistently good results from one of the schools may indicate that both the quality of the intervention and ability of the staff can have a significant impact on the outcomes. Co-occurring disorders may have an impact on performance, affecting individual scores during a short study period. Improvements in the non-intervention group may be due to other in-school support programmes.

Capturing Children's Attention: a novel tool for measuring visuo-motor attention

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RO Coats¹; LS Aucott²; JHG
Williams²; M Mon-Williams¹

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UK

Attention is a vital component in an abundance of activities integral to a child's development. Many classroom activities place concurrent demands on motor, perceptual and cognitive systems for children. For example, solving problems at a desk with a pen and paper whilst processing visual information from the whiteboard (and often also listening to instructions from the teacher). We aimed to investigate the bi-directional influences on performance that arise from the relationship between motor and attentional ability, doing so by comparing visuomotor ability under sustained- and divided-attention conditions in typically developing children and those with coordination difficulties.

children and those with coordination difficulties. Using a novel computerised assessment based around visuomotor smooth pursuit tracking, we measured visuomotor attention (VMA) on a tablet computer with a hand-held stylus. We predicted that children with coordination difficulties would choose to distribute their attention in a way that mitigated for their compromised visuo-motor ability. Subsequently it was found that, in divided-, compared to sustained-attention visuomotor tracking, tracking error only worsened in typically developing children and not those with coordination difficulties. Those with coordination difficulties instead showed greater impairment on the concurrent cue-detection task during the divided attention condition. This suggests that children with coordination difficulties exhibited a different response pattern compared to controls, a findings that fits with the idea that those with coordination difficulties devote more of their attentional resources to the motor aspects of complex tasks, often at the expense of competing visual and/or cognitive processing demands.

FOCUS GROUP SESSIONS

Day 1, 14.30 – 15.40

***European Academy of Childhood Disability:
DCD Clinical Practice Recommendations***

Led by Professor's David Sugden & Sheila Henderson

Ideally, professionals dealing with children and adults with DCD should be consistent in their approach to definition, assessment and intervention. Since 2012, an international group of academics and clinicians have been working on a set of clear recommendations for use in Europe which deals with these topics, taking account of the quality of research evidence for each one currently available. The first version of these Guidelines was published in the prestigious journal, *Developmental Medicine and Child Neurology* in 2012. More recently, the same group, under the guidance of Professor Rainer Blank, have been working on a revised, updated version. Since the final consensus meeting only took place in Stockholm in June, 2016, the finalised guidelines have not yet been produced but are expected later this summer.

It is hoped that these Guidelines will become the standard which all clinicians and researchers working with individuals with DCD in the UK will adopt. However, there may be some country-specific issues that need to be addressed before this can happen. Sheila Henderson and David Sugden have been part of the European group since its inception. In this session, they will outline some of the new issues that were discussed in Stockholm and answer questions concerning the implications for researchers and clinicians in the UK.

FOCUS GROUP SESSIONS

Day 2, 14.30 – 15.30

***Exploring innovative school-based therapeutic approaches
for supporting impaired motor skills:
Discussing challenges, opportunities and barriers to
implementation***

Led by Doctor Nick Preston, Wellcome Trust Research Fellow

The Born in Bradford observational cohort study has identified a large number of children with impaired motor skills that are typical of those observed in children with developmental coordination disorder. Schools have asked us repeatedly if they can do anything to improve the children's motor skills, particularly with regard to handwriting. Given the lack of resources and the pressures under which therapy teams are operating, we are exploring the feasibility of using activities supported by good quality evidence to develop a 'stand-alone' motor skills programme that can be implemented in schools by school staff. These activities include dynamic balancing skills, core stability, ball skills, manual dexterity and hand-eye eye coordination. We will formally evaluate usability and effectiveness of this programme.

In this workshop we are seeking stakeholder and expert academic engagement in the planning of this research, to help us identify likely challenges. We will explore example questions such as:

- From your perspective, what obstacles and difficulties do you consider likely?
- Without task-oriented activities following formal assessment, is it likely that the programme will have any effect?
- What outcomes should be evaluated?
- What is the minimum weekly 'dose' of the programme that would be expected to achieve any benefits?
- At what age should the programme be targeted?

ADDITIONAL INFORMATION

Accommodation

For those who have booked conference accommodation for Thursday 21st or Friday the 22nd of July, this will be based off-campus at the University's Oxley Halls of Residence (Weetwood Road, Leeds, LS16 8HL).

If you are checking-in on the Thursday after 5pm please notify the conference staff in advance. On the day then go directly to the Halls of Residence, who will have arranged a late-check in for you. *If you are staying only on the Friday* your accommodation check-in be handled at the same time as you register your arrival at the conference (i.e. at the conference helpdesk in the School of Psychology), saving you the need to check-in prior to getting to the conference.

Please note, this accommodation is approximately 15 min drive from the main university campus and a *shuttle bus* will be provided free of charge (on the mornings of the 22nd and 23rd [8am] and evening of the 22nd [5.30pm]) to transport you to and from the conference

Travel Information

At the conference, the nearest taxi rank can be found at the main entrance to the University, in front of the Parkinson building. Bus stops for the City Centre/Train Station (downhill) and Weetwood/Headingley (uphill) are also on the same road. The School of Psychology has a limited number of free parking spaces, please contact us in advance at dcd-uk@leeds.ac.uk if you would like to reserve one.

Conference Dinner

If you have booked a place at the conference dinner this will be held on the Friday night (22nd) at Santorini's Greek and Turkish Restuarant in Headingley (55A Otley Road, Leeds, LS6 3AB, tel: 0113 278 1532). Seating will be at 7pm

SCIENTIFIC COMMITTEE

With a special thanks to our scientific committee:

Prof. David Sugden - University of Leeds

Dr Liam JB Hill - University of Leeds

Dr Sara Magallón Recalde – Uni. of Leeds & Uni. of Navarra

Megan Wood - University of Leeds

Dr Angela Webb - Chair of National Handwriting Association

Michele Lee - Chair of Dyspraxia Foundation

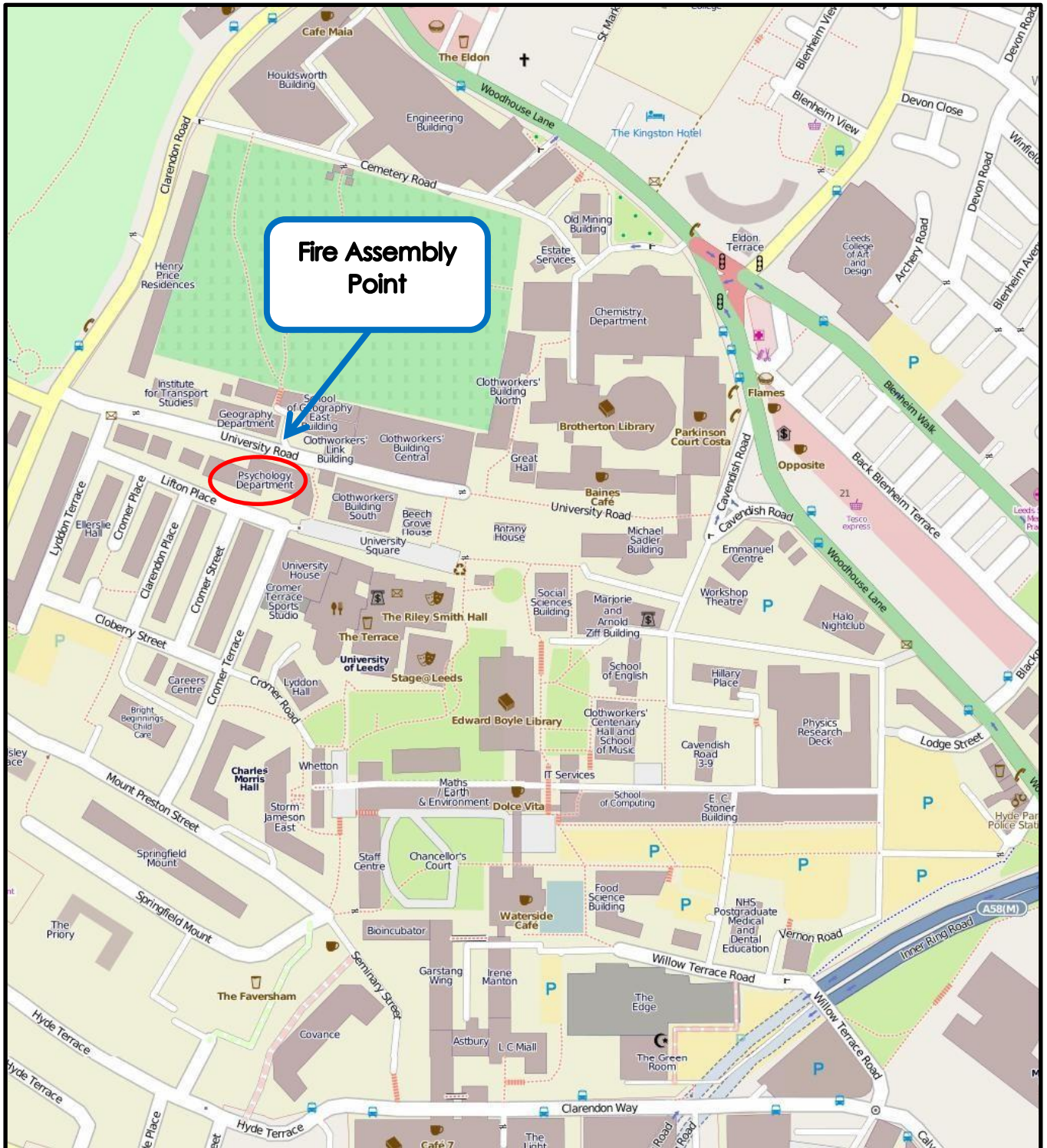
Dr Kate Wilmut - Chair of DCD-UK

Heather Angilley - Occupational Therapist

Professor Amanda Kirby - Chair of Movement Matters

Emeritus Professor Sheila Henderson - UCL Institute of Education

CAMPUS MAP



The DCD-UK conference event will be held entirely within the School of Psychology (circled in **Red**)

